Aphthous Ulcer

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Contents

Introduction

An aphthous ulcer, also known as aphthous stomatitis, is a common terrestrial condition, in which round or ovoid painful ulcers occur on the oral mucosa. They are often recurrent. The etiology is varied and includes oral trauma, recent viral infection (Herpes Simplex virus or “cold sore”), stress, and certain foods.[1] The damage is predominantly cell mediated with cytokines playing a role. Aphthous ulcers have been reported during space flight. For the space flight environment there may be a minor predisposing factor of immunologic dysregulation, which has been reported to occur in microgravity.[2]

The diagnosis of aphthous ulcers is a clinical one. In-flight treatment includes topical steroid ointment and oral lozenges.[3]

Clinical Priority and Clinical Priority Rationale by Design Reference Mission

One of the inherent properties of space flight is a limitation in available mass, power, and volume within the space craft. These limitations mandate prioritization of what medical equipment and consumables are manifested for the flight, and which medical conditions would be addressed. Therefore, clinical priorities have been assigned to describe which medical conditions will be allocated resources for diagnosis and treatment. “Shall” conditions are those for which diagnostic and treatment capability must be provided, due to a high likelihood of their occurrence and severe consequence if the condition were to occur and no treatment was available. “Should” conditions are those for which diagnostic and treatment capability should be provided if mass/power/volume limitations allow. Conditions were designated as “Not Addressed” if no specific diagnostic and/or treatment capability are expected to be manifested, either due to a very low likelihood of occurrence or other limitations (for example, in medical training, hardware, or consumables) that would preclude treatment. Design Reference Missions (DRMs) are proposed future missions designated by a set of assumptions that encompass parameters such as destination,

length of mission, number of crewmembers, number of Extravehicular Activities (EVAs), and anticipated level of care. The clinical priorities for all medical conditions on the Exploration Medical Condition List (EMCL) can be found here (https://humanresearchwiki.jsc.nasa.gov/index.php?title=Category:All_DRM). The EMCL document may be accessed here (https://humanresearchwiki.jsc.nasa.gov/images/6/62/EMCL_RevC_2013.pdf).

Design Reference Mission	Clinical Priority	Clinical Priority Rationale
Lunar sortie mission Assumptions: ▪ 4 crewmembers (3 males, 1 female) ▪ 14 days total ▪ 4 EVAs/ crewmember ▪ Level of Care 3	Not Addressed	The minor symptomatology caused by most aphthous ulcers does not merit the mass and volume of carrying specific treatment. Preventive strategies may include good oral hygiene, avoiding nutritional deficiencies, and taking care to avoid oral trauma.
Lunar outpost mission Assumptions: ▪ 4 crewmembers (3 males, 1 female) ▪ 180 days total ▪ 90 EVAs/ crewmember ▪ Level of Care 4	Not Addressed	The minor symptomatology caused by most aphthous ulcers does not merit the mass and volume of carrying specific treatment. Preventive strategies may include good oral hygiene, avoiding nutritional deficiencies, and taking care to avoid oral trauma.
Near-Earth Asteroid (NEA) mission Assumptions: ▪ 3 crewmembers (2 males, 1 female) ▪ 395 days total ▪ 30 EVAs/ crewmember ▪ Level of Care 5	Not Addressed	The minor symptomatology caused by most aphthous ulcers does not merit the mass and volume of carrying specific treatment. Preventive strategies may include good oral hygiene, avoiding nutritional deficiencies, and taking care to avoid oral trauma.

Initial Treatment Steps During Space Flight

A link is provided to a prior version of the International Space Station (ISS) Medical Checklist, which outlines the initial diagnostic and treatment steps recommended during space flight for various conditions which may be encountered onboard the ISS. Further diagnostic and treatment procedures beyond the initial steps outlined in the Medical Checklist are then recommended by the ground-based Flight Surgeon, depending on the clinical scenario. Please note that this version does not represent current diagnostic or treatment capabilities available on the ISS. While more recent versions of this document are not accessible to the general public, the provided version of the checklist can still provide a general sense of how medical conditions are handled in the space flight environment. Medical Checklists will be developed for exploration missions at a later point in time.

Please note this file is over 20 megabytes (MB) in size, and may take a few minutes to fully download.

ISS Medical Checklist (http://www.nasa.gov/centers/johnson/pdf/163533main_ISS_Med_CL.pdf)

Capabilities Needed for Diagnosis

The following is a hypothetical list of capabilities that would be helpful in diagnosis. It does not necessarily represent the current capabilities available onboard current spacecraft or on the ISS, and may include capabilities that are not yet feasible in the space flight environment.

- Light source (such as a penlight)
- Tongue depressor
- Imaging capability (such as a camera)

Capabilities Needed for Treatment

The following is a hypothetical list of capabilities that would be helpful in treatment. It does not necessarily represent the current capabilities available onboard current spacecraft or on the ISS, and may include capabilities that are not yet feasible in the space flight environment.

- Topical corticosteroids
- Antiseptic mouthwash (such as Chlorhexidine)
- Antibiotic mouthwash
- Analgesics (non narcotic, oral)

Associated Gap Reports

2.01 - We do not know the quantified health and mission outcomes due to medical events during exploration missions.
3.01 - We do not know the optimal training methods for in-flight medical conditions identified on the Exploration

Medical Condition List taking into account the crew medical officer's clinical background. (Closed)
3.03 - We do not know which emerging technologies are suitable for in-flight screening, diagnosis, and treatment during exploration missions.
4.01 - We do not have the capability to provide a guided medical procedure system that integrates with the medical system during exploration missions.
4.02 - We do not have the capability to provide non-invasive medical imaging during exploration missions.
4.11 - Limited dental care capabilities (Closed)
4.14 - We do not have the capability to track medical inventory in a manner that integrates securely with the medical system during exploration missions.
4.15 - Lack of medication usage tracking system that includes automatic time stamping and crew identification
4.17 - We do not have the capability to package medications to preserve stability and shelf-life during exploration missions.
4.24 - Lack of knowledge regarding the treatment of conditions on the Space Medicine Exploration Medical Condition List in remote, resource poor environments (Closed)
5.01 - We do not have the capability to comprehensively manage medical data during exploration missions.

Other Pertinent Documents

List of Acronyms

D	
DRM	Design Reference Mission
E	
EMCL	Exploration Medical Condition List
EVA	Extravehicular Activity
I	
ISS	International Space Station
M	
MB	Megabytes
N	
NEA	Near Earth Asteroid

References

1. Merck Manual. Ear, Nose, Throat and Dental Disorders. Porter RS, editor. 2006. Whitehouse Station, N.J, Merck Sharp & Dohme Corp.
2. Sams CF, Pierson DL. Immunologic Concerns. In: Barratt MR, Pool SL (eds.), Principles of Clinical Medicine for Space Flight. New York: Springer; 2008.
3. International Space Station Integrated Medical Group. Medical Checklist ISS - All Expeditions. Houston: National Aeronautics and Space Administration; 2008 (Internal NASA document - Not publicly available).

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